

REMARKS:

Claims 1-28 are in the case and presented for consideration.

The claims have been amended to eliminate the multiple dependencies and to place the same in better form for U.S. practice.

Entry of the above is earnestly solicited.

Respectfully submitted,



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WHAT IS CLAIMED IS:

1. A combustion method comprising steps of: forming combustion air so as to have a jet flow cross section having a larger specific surface area than that in a case of supplying from a circular throat the same quantity of combustion air as said combustion air has; injecting said combustion air into a furnace having a furnace temperature of not less than 800°C; and injecting fuel toward a jet flow of said air for causing a jet flow of said fuel to be rapidly mixed with said air jet flow with strong turbulences before losing velocity energy of said fuel jet flow.
- 10 2. A combustion method according to claim 1, wherein said combustion air is supplied after being preheated to have a high temperature close to a temperature of combustion exhaust gas by collecting heat of said combustion exhaust gas exhausted from a regenerative medium.
- 15 3. A combustion method according to claim 1 or 2, wherein said combustion air is formed into a jet flow which is flat and has a thin radial thickness as a whole.
- 20 4. A combustion method according to any of claims 1 to 3, wherein said fuel is injected from at least two separate injection openings, caused to collide with an air jet flow having an increased specific surface area in a wide area, and rapidly mixed with said air jet flow with strong turbulences.
- 25 5. A combustion method according to any of claims 1 to 4, wherein a plurality of said fuel jet flows are formed, and said fuel jet flows collide with each other before coming in contact with said air jet flow.
6. A combustion method according to any of claims 1 to 4, wherein a

plurality of said air jet flows are formed, and said air jet flows collide with each other before coming in contact with said fuel jet flow.

7. A combustion method according to ~~any of claims 1 to 4~~, wherein a plurality of said fuel jet flows and said air jet flows are formed, and said 5 air jet flows collide with each other and said fuel jet flows collide with each other before said fuel jet flows collide with said air jet flows.

8. A combustion method according to ~~any of claims 1 to 7~~, wherein a plurality of pairs of said fuel jet flows and said air jet flows which collide with each other in said furnace are formed in order to form a large 10 combustion field.

9. A combustion method according to ~~any of claims 1 to 8~~, wherein said combustion air whose quantity is less than a theoretical air quantity is supplied and high-temperature air combustion for forming a non-oxidizing atmosphere or a reduction atmosphere is carried out.

15 10. A combustion method according to ~~any of claims 1 to 8~~, wherein said combustion air whose quantity is not less than the theoretical air quantity is supplied and high-temperature air combustion by turbulent diffusion mixing is provoked.

11. A burner comprising: an air throat for forming a combustion air so as 20 to have a jet flow cross section having a larger specific surface area than that in a case of supplying from a circular throat the same quantity of combustion air as said combustion air has and for injecting a full quantity of said combustion air into a furnace having a furnace temperature of not less than 800°C; and a fuel nozzle for injecting fuel into said furnace so as 25 to cause a jet flow of said fuel to collide with said air jet flow at a position

away from an injection opening of said air throat by a specific distance before losing velocity energy of said fuel jet flow.

12. A burner according to claim 11, wherein said air throat has a flat rectangular opening.

5 13. A burner according to claim 11, wherein said specific surface area can be increased by dividing said air throat into a plurality of small holes.

14. A burner according to claim 11, wherein said air throat is divided into a plurality of small holes, and respective jet flows are continuously arranged in a form of a line without being independent to form a jet flow

10 having a flat cross-sectional shape as a whole.

15. A burner according to claim 13 ~~or 14~~, wherein a plurality of said small holes form a jet flow in which said air jet flows collide with each other before coming in contact with said fuel jet flow.

16. A burner according to ~~any of claims 11 to 15~~, wherein said fuel nozzle

15 has at least two injection openings and causes said fuel to collide with said air jet flow having an increased specific surface area in a wide area.

17. A burner according to ~~any of claims 11 to 15~~, wherein said fuel nozzle

has at least two injection openings and forms a jet flow in which fuel jet flows injected from said respective injection openings collide with each other before coming in contact with said air jet flow.

20 18. A burner according to ~~any of claims 11 to 17~~, wherein a plurality of said fuel nozzles are arranged so as to surround said air jet flow.

19. A burner according to claim 18, wherein a plurality of said fuel nozzles form a jet flow in which said fuel jet flows collide with each other

25 before coming in contact with said air jet flow.

20. A burner according to ~~any of claims 11 to 18~~, wherein a plurality of said air jet flows and a plurality of said fuel jet flows are formed, and said air jet flows collide with each other and said fuel jet flows collide with each other before said air jet flows collide with said fuel jet flows.
- 5 21. A burner according to ~~any of claims 11 to 20~~, wherein said air throat includes a regenerative medium and flow switching means for alternately leading combustion exhaust gas and combustion air to said regenerative medium, and injects into said furnace said combustion air preheated to have a high temperature close to a combustion exhaust gas temperature
- 10 through said regenerative medium.
22. A burner according to claim 21, wherein a ceramic honeycomb is included as said regenerative medium.
23. A burner according to claim 21 or 22, wherein said regenerative medium is included in said air throat, and said flow switching means is directly connected to a burner body constituting said air throat and switches said combustion air and said exhaust gas at a short distance from said regenerative medium.
- 15 24. A burner according to ~~any of claims 11 to 23~~, wherein said combustion air supplied from said air throat has a quantity which is less than a theoretical air quantity, and high-temperature air combustion for forming a non-oxidizing atmosphere or a reduction atmosphere is carried out.
- 20 25. A burner according to ~~any of claims 11 to 23~~, wherein said combustion air supplied from said air throat has a quantity which is not less than the theoretical air quantity and high-temperature air

combustion by turbulent diffusion mixing is provoked.

26. A burner according to claim 24, wherein said fuel is injected with a ratio de/D_{pcd} of a corresponding diameter de of an opening of said air throat and a gap $1/2D_{pcd}$ from a center of said air throat to a center of
5 said fuel nozzle falling within a range of 0.1 to 0.5 and with a ratio La/de of said corresponding diameter de of said air throat relative to a distance La from an intersection of a fuel injection axis and a plane on a central axis in a longitudinal direction of said air throat to an outlet surface of said air throat falling within a range of 1.0 to 5.0.
- 10 27. A burner according to claim 25, wherein said fuel is injected with a ratio de/D_{pcd} of a corresponding diameter de of an opening of said air throat and a gap $1/2D_{pcd}$ from a center of said air throat to a center of said fuel nozzle falling within a range of 0.1 to 0.5 and with a ratio La/de of said corresponding diameter de of said air throat relative to a distance
15 La from an intersection of a fuel jet flow axis and a plane on a central axis in a longitudinal direction of said air throat to an outlet surface of said air throat falling within a range of 2.0 to 10.0.
- 20 28. A burner according to ~~any of claims 11 to 27~~, a plurality of pairs of said air throats and said fuel nozzles are set to constitute a large combustion machine.